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PHYLOGENY OF THE MICROSPERMAE—I*

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ABSTRACT

The paper discusses the comparative floral morphology of the Burmanniaceae, the Apostasiaceae and the Orchidaceae on the basis of an earlier study of this author on *Burmannia pusilla*. The affinities and the evolutionery problem of the taxa concerned are discussed and it is thought that the Englerian arrangement of retaining the three families under a single order to be more in accordance with the facts. The need for further studies to adduce more evidence in connection with the phylogeny of the Microspermae as a whole is pointed out.

INTRODUCTION

Studies in the floral anatomy of the Englerian Microspermae, apart from the fragmentary account of Saunders (1937) for the Burmanniaceae and the classic work of Swamy (1948) on the orchids, as far as the present author is aware, are wanting. It is, of late, recognized that the anatomical tool, if judiciously applied, is of considerable utility in the resolution of morphological and phylogenetic problems. In a recent investigation of the floral anatomy of a species of *Burmannia*, the writer found the presence of parenchymatous bands connecting the stamens with the style—a condition hitherto unreported for the family. This raises some interesting possibilities as regards the phylogeny and the taxonomy of the Microspermae which the writer proposes to discuss here. A fuller discussion, however, must cover extensive and intensive studies of the Burmanniaceae and the Apostasiaceae. The present paper, therefore, is a preliminary effort directed towards this end.

DISCUSSION

In taxonomic literature (Hutchinson, 1934; Lawrence, 1951; Rendle, 1930), are found references to a more or less similar situation (as described above for *Burmannia*), in the Apostasiaceae wherein the number of stamens is two or three and the filaments are free or united at the base and to the style. Two of the three stamens in this family belong to the inner whorl while the odd one is the dorsal stamen (of the outer androecial whorl), which is functional in *Neuwiedia*, staminodal in *Apostasia* and arrested in *Adactylus*. In *Cypripedium* of the diandrous orchids, the "central pillar-like structure—the gynostemium" characteristic of monandrous forms, "is not clearly evidenced and it is incipient if it is present at all" (Swamy, 1948). Here also, the two lateral stamens of the inner whorl are functional. In monandrous forms, these are reduced and the dorsal stamen, which is arrested in the Cypripedilineae, is functional. In the Burmanniaceae, either all the six or only the inner three stamens are developed. Development of certain stamens in one taxon that are suppressed in another might be regarded as features representing modifications in evolutionery specialization. Even in the family Orchidaceae itself, the functional stamens in the two main groups belong to two different whorls. If zygomorphy is characteristic of the orchid flower in general, still a primitive actinomorphic orchidaceous perianth is found in the Australian genus *Thelymitra* (Hutchinson, 1948). Actinomorphy prevails in the Apostasiaceae and the Burmanniaceae, excepting the tribe Corsieae of the latter family.

Hutchinson (1934), in his phyletic treatment of the petaloid monocotyledoneae accepts the contention of several orchidologists including Schlechter that the Apostasiaceae are not orchids and places them in his order Haemodorales and elevates the Burmanniaceae along with two other families (tribes of Burmanniaceae, cf. Rendle, 1930), to the order Burmanniales. He remarks that the Orchidaceae and the Burmanniaceae developed along parallel lines from a common apostasiaceous stock. Evidence based upon variations in the stomatal complex amongst monocotyledons has, of late, been marshalled to suggest that the stomatal complex with two guard cells and no subsidiaries "seems to have arisen only once in evolutionery history" (Stebbins and Khush, 1961). In all the three families under discussion, the stomatal complex is without subsidiaries. Stebbins and Khush (*l.c.*) regard the Engler and Gilg arrangement which places the Apostasiaceae as an "aberrent off-shoot" of the orchids as more nearly correct, since the stomatal complex in the other families under

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*The writer makes an earnest request to botanists the world over to kindly send him fixed flowering material of other burmannean and apostasiaceous species.

Hutchinson's Haemodorales excepting the Taccaceae contain the subsidiaries.

The crux of the seemingly complex phylogenetic problem, in the opinion of the author, appears to be this: If the Apostasiaceae are an "aberrent offshoot" of the orchids, are the Burmanniaceae to be considered as having evolved along parallel lines with the orchids and, if so, is it from an apostasiaceous stock as Hutchinson holds or from a more remote primitive liliaceous one? In this connection, the remarks of Stebbins and Khush that ". with a few exceptions, the taxa of this type" (having stomatal complex without subsidiaries) "are all clearly related to each other and, in respect to floral characteristics, can be regarded as one or a few related and parallel lines of increasing specialization starting with the more primitive Liliales", seem significant. Although the union of the stamens with the style in *Burmannia pusilla* is for a short length, it tends to fill in a significant void between the Burmanniaceae and the Apostasiaceae, and, if this condition is found to be of more general occurrence in the family, the statement of Hutchinson that the affinity of the Burmanniaceae with the orchids "is probably closer than at first appears" might possibly be nearer the truth. That the Apostasiaceae are considered as an "aberrent offshoot" of the orchids is significant in this connection. The variations in development of the situation under discussion observed in *Burmannia pusilla,* if obtained in other burmannean species, might also provide valuable data of morphological and phylogenetic significance. It may, however, be pointed out here that Jonker (1938), considered attempts to ally this family with the orchids as based on artificial or inconstant characters.

Furthermore, the systematic positions of the taxa concerned are also worthy of comment. Are the three families best placed in a single taxon such as the Englerian Microspermae or is the separation of the Burmanniaceae from this taxon warranted? One might state that the Englerian arangement is more in keeping with the facts. This is, however, a tentative inference that one can draw since a fuller and more complete appraisal cannot be attempted with the evidence at hand. The writer feels that anatomical investigations of the Burmanniaceae and the Apostasiaceae may adduce a good deal of evidence to put us on a sounder ground to discuss the morphological, taxonomic and phylogenetic problems in this most highly evolved group of petaloid monocotyledons.

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